



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,616	11/18/2003	Yi-Nan Chen	10113181	4872
34283 7590 02/15/2007 QUINTERO LAW OFFICE, PC 2210 MAIN STREET, SUITE 200 SANTA MONICA, CA 90405			EXAMINER CHACKO DAVIS, DABORAH	
			ART UNIT 1756	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		02/15/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/715,616

Applicant(s)

CHEN ET AL.

Examiner

Daborah Chacko-Davis

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 16-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 8 and 15 is/are rejected.
- 7) ☒ Claim(s) 6 and 9-14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>06/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 1-15, in the reply filed on November 9, 2006, is acknowledged. Claims 16-32, are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 7-8, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 7, at line 2, recites the limitation "the first liner". There is insufficient antecedent basis for this limitation in the claim.

5. Claim 8, at liner 4, recites the limitation "the first liner". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 1756

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-2, 4, and 15, are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent No. 6,548,394 (Peng et al., hereinafter referred to as Peng).

Peng, in the abstract, in col 2, lines 42-67, in col 3, lines 25-32, and lines 40-47, and in col 4, lines 1-42, discloses a method of forming a bit line contact plug (a damascene contact plug, see figure 2J), by providing a semiconductor substrate (reference 50 of figure 2A), the substrate has first and second gate conductive structures (see references 562, 563 of figure 2A), and a source/drain region (reference 60 of figure 2A) between the gate structures, forming a first conductive layer (reference 70 of figure 2E) over the gate conductive structures and the source/drain region (thereby the conducting layer stays electrically connected to the source/drain region), forming an ILD (inter-layer dielectric) layer (reference 72 of figure 2G) with a planarized surface over the entire surface of the substrate i.e., over the conductive structures and the first conductive layer. Peng, in col 4, lines 12-35, discloses forming a bit line contact hole (reference 741 in figure 2H) in the ILD layer resulting in the exposure of the first conductive layer, and forming a second conductive layer (reference 76 of figure 2J) in the bit line contact hole such that the first conductive layer and the second conductive layer serves as a damascene contact plug (claim 1). Peng, in col 3, lines 50-67, in col 4, lines 1-42, discloses forming a liner layer (first liner) that covers the gate conductive structures, and the substrate; forming a first photoresist layer on the liner layer and

Art Unit: 1756

forming an opening (see figure 2D) in the photoresist layer (reference 69 of figure 2D) corresponding to that of the bit line contact hole; removing the exposed liner layer (portions of liner layer within the bit line contact hole region) via etching through the opening in the photoresist mask, followed by removing the first photoresist layer; forming a first conductive layer on the gate conductive structure (first and second) after the removal of the first photoresist layer, and performing a CMP process on the first conductive layer so as to planarize the first conductive layer such that the top surface of the first conductive layer is equal to or higher than the liner layer on the gate conductive structures (see figure 2E); forming a second photoresist mask layer on the planarized first conductive layer, and forming a photoresist mask pattern on the first conductive layer, corresponding to that of the bit line contact hole, and etching the exposed portions of the conductive layer (portions not masked, see figure 2F), such that first conductive layer remains in tact in the space between the gate conductive structures, and remains in electrical contact with the source/drain region (reference 66 of figure 2F) (claim 2). Peng, in col 3, lines 50-51, discloses that the first liner (liner layer) is a SiN layer or a SiON layer (claim 4). Peng, in col 4, lines 35-36, discloses that the second conductive layer is polysilicon, tungsten or other conductive materials (claim 15).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 1756

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S.

Patent No. 6,548,394 (Peng et al., hereinafter referred to as Peng) in view of U. S.

Patent Application Publication No. 6,274,471 (Hsu et al., hereinafter referred to as Hsu)

Peng is discussed in paragraph no. 7.

Peng, in col 3, lines 65-67, and in col 4, lines 1-10, discloses that the second photoresist layer is removed.

The difference between the claims and Peng is that Peng does not disclose that a wet etching is performed to remove polymer residue from the substrate.

Hsu, in [0012], discloses that the a wet etching is performed on the substrate (after removal of photoresist) so as to remove the residual film (polymer) of the photoresist from the substrate.

Therefore, it would be obvious to a skilled artisan to modify Peng by employing the wet etching process suggested by Hsu because Hsu, in [0026] suggests that using a wet etch process enables an isotropic etching process, and Hsu, in [0036], discloses that the wet etching produces for the removal of residual films produces the most optimal results with a high process yield.

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S.

Patent No. 6,548,394 (Peng et al., hereinafter referred to as Peng) in view of U. S.

Patent No. 6,713,335 (Yen et al., hereinafter referred to as Yen).

Peng is discussed in paragraph no. 7.

The difference between the claims and Peng is that Peng does not disclose that the liner layer has a thickness of about 100-120Å (claim 5).

Yen, in col 4, lines 24-26, discloses that the liner layer can be formed at a thickness between about 30 to 500Å.

Therefore, it would be obvious to a skilled artisan to modify Peng by employing the liner thickness suggested by Yen because Yen, in col 4, lines 23-30, discloses that employing the suggested liner thickness offers improved dielectric integrity to the device, and Peng, in col 3, lines 66-67, and in col 4, lines 1-2, discloses that the liner layer behaves as an etch stop layer.

Allowable Subject Matter

11. Claims 6, and 9-14, are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 6, 9-14, are allowable over the prior art of record (U. S. Patent No. 6,548,394 (Peng et al., hereinafter referred to as Peng), U. S. Patent Application Publication No. 6,274,471 (Hsu et al., hereinafter referred to as Hsu), and U. S. Patent No. 6,713,335 (Yen et al., hereinafter referred to as Yen)) because the prior art of record does not disclose performing a chemical mechanical polishing process on the first inter-layer dielectric, in which the top of the first inter-layer dielectric is leveled off with the top of the second liner, and forming a second inter-layer dielectric to cover the first inter-layer dielectric and the second liner.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

January 25, 2007.

A handwritten signature in black ink, appearing to read 'Mark F. Huff', with a stylized flourish extending from the end.

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700